

**OpenVMS**

# **HP StorageWorks Disk Array XP operating system configuration guide**

XP48  
XP128  
XP512  
XP1024  
XP12000

fourth edition (November 2004)

part number: A5951-96132

This guide describes the requirements and procedures for connecting and configuring the XP family of disk arrays to work with an AlphaServer running the OpenVMS operating system.



Copyright © 2000 - 2004 Hewlett-Packard Development Company, L.P., all rights reserved

Hewlett-Packard Company makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

This document contains proprietary information, which is protected by copyright. No part of this document may be photocopied, reproduced, or translated into another language without the prior written consent of Hewlett-Packard. The information contained in this document is subject to change without notice.

Product names mentioned herein may be trademarks of their respective companies.

Hewlett-Packard Company shall not be liable for technical or editorial errors or omissions contained herein. The information is provided "as is" without warranty of any kind and is subject to change without notice. The warranties for Hewlett-Packard Company products are set forth in the express limited warranty statements accompanying such products. Nothing herein should be construed as constituting an additional warranty.

Printed in the U.S.A.

*HP StorageWorks Disk Array XP Operating System Configuration Guide: OpenVMS*

fourth edition (November 2004)  
part number: A5951-96132

---

# Contents

About this guide	5
Intended audience	5
Disk arrays	5
Related documentation	5
Conventions	6
HP technical support	7
HP storage website	7
HP authorized reseller	8
Revision history	9
Warranty statement	10
<b>1 Installation</b>	<b>13</b>
Features and requirements	14
Fibre Channel interface	15
Device emulation types	15
RAID Manager command devices	16
Failover	16
SNMP configuration	17
Installation procedures	18
Install and configure the disk array	19
Setting the System Option Modes	20
Configuring the Fibre Channel ports	21
Setting the Host Mode for the disk array ports	23
Install and configure the host	24
Loading the OS and software	24
Installing and configuring the HBAs	24
Clustering and fabric zoning	25
Fabric zoning and LUN security for multiple operating systems	26

Configure FC switches	27
Defining the paths	27
Connect the disk array	29
Verifying disk array device recognition	29
Configure disk array devices	30
Initializing and label the devices	30
Mounting the devices	30
Verifying file system operation	30
<b>2 Troubleshooting</b>	<b>33</b>
Error conditions	34
Calling the HP support center	36
<b>A Disk array device emulations</b>	<b>37</b>
Supported emulations	38
Device type specifications	39
<b>Glossary</b>	<b>43</b>
<b>Index</b>	<b>47</b>

---

# About this guide

This guide describes the requirements and procedures for connecting and configuring the XP family of disk arrays to work with an AlphaServer host running the OpenVMS operating system.

## Intended audience

This guide is intended for system administrators who have knowledge of the following topics:

- Data processing concepts
- Direct access storage device subsystems and their basic functions
- Disk arrays and RAID technology
- Operating system commands and utilities

## Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP512  
HP Surestore Disk Array XP48  
HP StorageWorks Disk Array XP128  
HP StorageWorks Disk Array XP1024  
HP StorageWorks XP12000 Disk Array

## Related documentation

HP provides the following related documentation:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks Command View XP for XP Disk Arrays: User Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*
- *Guidelines for OpenVMS Cluster Configurations (Chapter 7)*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

## Conventions

This guide uses the following text conventions.

<a href="#">Figure 1</a>	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
<a href="http://www.hp.com">www.hp.com</a>	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
<b>literal</b>	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
<i>variable</i>	Italic type indicates that you must supply a value. Italic type is also used for manual titles.
<code>input/output</code>	Monospace font denotes user input and system responses, such as output and messages.
<i>Example</i>	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[ ]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
	Separates alternatives in a list of options.

## HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arraysystems.html>

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

## HP storage website

For the most current information about HP StorageWorks XP products, visit the support website. Select the appropriate product or solution from this website:

<http://h18006.www1.hp.com/storage/arraysystems.html>

For information about product availability, configuration, and connectivity, consult your HP account representative.

## HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States      1-800-345-1518

Canada              1-800-263-5868

Or contact:        [www.hp.com](http://www.hp.com)



---

## Revision history

September 2000	First release
March 2001	Added appendixes D, E, and glossary
February 2003	Updates
November 2003	Updates
July 2004	Updates for version 7.3
November 2004	Updated for XP12000

---

## Warranty statement

HP warrants that for a period of ninety calendar days from the date of purchase, as evidenced by a copy of the invoice, the media on which the Software is furnished (if any) will be free of defects in materials and workmanship under normal use.

**DISCLAIMER. EXCEPT FOR THE FOREGOING AND TO THE EXTENT ALLOWED BY LOCAL LAW, THIS SOFTWARE IS PROVIDED TO YOU “AS IS” WITHOUT WARRANTIES OF ANY KIND, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. HP SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, NON-INFRINGEMENT, TITLE, ACCURACY OF INFORMATIONAL CONTENT, AND FITNESS FOR A PARTICULAR PURPOSE.** Some jurisdictions do not allow exclusions of implied warranties or conditions, so the above exclusion may not apply to you to the extent prohibited by such local laws. You may have other rights that vary from country to country, state to state, or province to province.

**WARNING! YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT USE OF THE SOFTWARE IS AT YOUR SOLE RISK.** HP DOES NOT WARRANT THAT THE FUNCTIONS CONTAINED IN THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED, VIRUS-FREE OR ERROR-FREE, OR THAT DEFECTS IN THE SOFTWARE WILL BE CORRECTED. THE ENTIRE RISK AS TO THE RESULTS AND PERFORMANCE OF THE SOFTWARE IS ASSUMED BY YOU. HP DOES NOT WARRANT OR MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF THE SOFTWARE OR RELATED DOCUMENTATION IN TERMS OF THEIR CORRECTNESS, ACCURACY, RELIABILITY, CURRENTNESS, OR OTHERWISE. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY HP OR HP’S AUTHORIZED REPRESENTATIVES SHALL CREATE A WARRANTY.

**LIMITATION OF LIABILITY. EXCEPT TO THE EXTENT PROHIBITED BY LOCAL LAW, IN NO EVENT INCLUDING NEGLIGENCE WILL HP OR ITS SUBSIDIARIES, AFFILIATES, DIRECTORS, OFFICERS, EMPLOYEES, AGENTS OR SUPPLIERS BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER DAMAGES (INCLUDING LOST PROFIT, LOST DATA, OR DOWNTIME COSTS), ARISING OUT OF THE USE, INABILITY TO USE, OR THE RESULTS OF USE OF THE SOFTWARE, WHETHER BASED IN WARRANTY, CONTRACT, TORT OR OTHER LEGAL THEORY, AND WHETHER OR NOT ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Your use of the Software is entirely at your own risk. Should the Software prove defective, you assume the entire cost of all service, repair or correction. Some jurisdictions do not allow the exclusion or limitation of liability for incidental or consequential damages, so the above limitation may not apply to you to the extent prohibited by such local laws.

**NOTE. EXCEPT TO THE EXTENT ALLOWED BY LOCAL LAW, THESE WARRANTY TERMS DO NOT EXCLUDE, RESTRICT OR MODIFY, AND ARE IN ADDITION TO, THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE LICENSE OF THE SOFTWARE TO YOU; PROVIDED, HOWEVER, THAT THE CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS SPECIFICALLY DISCLAIMED AND SHALL NOT GOVERN OR APPLY TO THE SOFTWARE PROVIDED IN CONNECTION WITH THIS WARRANTY STATEMENT.**



---

# Installation

You and your HP service representative each play a role in installation. Your HP service representative is responsible for installing the disk array and formatting the disk devices. You are responsible for configuring the host server for the new devices with assistance from your HP service representative.

---

## Features and requirements

The disk array and host have the following features:

- **Storage capacity.** The storage capacity for each model is listed below:

**XP48:** Up to 48 drives from 72 GB to 8.7 TB, 24 FC ports

**XP128:** From 8 to 128 drives for up to 18 TB, 48 FC ports

**XP512:** Up to 512 drives from 72 GB to 93 TB, 48 FC ports

**XP1024:** From 8 to 1024 drives for up to 149 TB, 64 FC ports

**XP12000:** Up to 1152 drives for up to 165 TB, 128 FC ports

- **Server support.** PCI-based AlphaServers
- **Operating system support.** OpenVMS 7.3 or later

Before installing the disk array, ensure the environment conforms to these requirements:

- Alpha System Firmware version 5.6 or higher for Fibre Channel support.
- Host Bus Adapters (HBAs). Install HBAs and all utilities and drivers. Refer to the adapter documentation for installation details.
- *(Recommended)* HP StorageWorks Command View XP with LUN management feature or Remote Control with LUN Configuration Manager XP option. These are used to configure disk array ports and paths.
- *(Recommended)* HP StorageWorks Secure Manager XP. Allows the host to access only authorized array devices.
- Other available XP Software (some may not be supported by your system):
  - HP StorageWorks Business Copy XP
  - HP StorageWorks Continuous Access XP
  - HP StorageWorks Continuous Access Extension XP
  - HP StorageWorks Auto LUN XP
  - HP StorageWorks Data Exchange XP
  - HP StorageWorks Resource Manager XP
  - HP StorageWorks RAID Manager XP

HP StorageWorks Cache LUN XP  
HP StorageWorks Auto Path XP  
HP StorageWorks Cluster Extension XP  
HP StorageWorks Performance Advisor XP

## Fibre Channel interface

The XP family of disk arrays supports these Fibre Channel elements:

- Connection speed of 1 Gbps and 2 Gbps
- Short-wave non-OFC (open fiber control) optical interface
- Multimode optical cables with SC or LC connectors
- Public or private arbitrated loop (FC-AL) or direct fabric attach
- Fibre Channel switches

Even though the interface is Fibre Channel, this guide uses the term “SCSI disk” because disk array devices are defined to the host as SCSI disks.

## Device emulation types

The XP family of disk arrays supports these device emulation types:

- **OPEN-x devices:** OPEN-x logical units represent disk devices. Except for OPEN-V, these devices are based on fixed sizes. OPEN-V is a user-defined size. Supported emulations include OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices.
- **LUSE devices (OPEN-x\*n):** Logical Unit Size Expansion (LUSE) devices combine 2 to 36 OPEN-x devices to create expanded LDEVs larger than standard OPEN-x disk devices. For example, an OPEN-x LUSE volume created from ten OPEN-x volumes is designated as OPEN-x\*10.
- **CVS devices (OPEN-x CVS):** Volume Size Configuration (VSC) defines custom volumes (CVS) that are smaller than normal

fixed-sized logical disk devices (volumes). (OPEN-V is a CVS-based custom disk size that you determine. OPEN-L does not support CVS.)

- **LUSE (expanded) CVS devices (OPEN-x\*n CVS):** LUSE CVS combines CVS devices to create an expanded device. This is done by first creating CVS custom-sized devices and then using LUSE to combine from 2 to 36 CVS devices. For example, if three OPEN-9 CVS volumes are combined to create an expanded device, this device is designated as OPEN-9\*3-CVS.

## RAID Manager command devices

HP's RAID Manager optional software product manages Business Copy (BC) or Continuous Access (CA) operations from a host server. To use RAID Manager with BC or CA, use Command View or LUN Configuration Manager to designate at least one disk array LDEV as a Raid Manager command device. Refer to the Command View or LUN Configuration Manager user guide for information about how to designate a command device.

On the OS side, you should create a LUN 0 device of 35 megabytes (the smallest allowed). This will allow you to use host-based RAID management tools available from HP and will also allow HP support to do some additional diagnostics.

Note that storage assigned to the LUN 0 device is not accessible from OpenVMS.

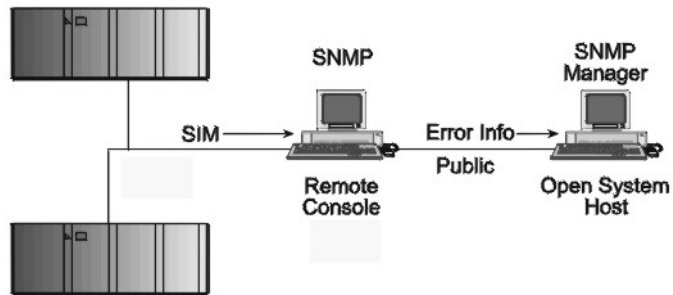
## Failover

The XP family of disk arrays supports many standard software products, including Open VMS Multipath Software, that provide host, application, or I/O path failover and logical volume (storage) management.



## SNMP configuration

The XP family of disk arrays supports standard Simple Network Management Protocol (SNMP) to remotely manage the disk array from the host. The SNMP agent on the remote console PC or Command View can provide status and Remote Service Information Message (R-SIM) reporting to the SNMP manager on the host for up to eight disk arrays. Refer to the operating system documentation to configure the SNMP manager on the host.



---

# Installation procedures

Perform these actions to set up the disk array:

1. [Install and configure the disk array \(page 19\)](#)
  - Setting the System Option Modes
  - Configuring the Fibre Channel ports
2. [Install and configure the host \(page 24\)](#)
  - Loading the OS and software
  - Installing and configuring the HBAs
  - Clustering and fabric zoning
3. [Configure FC switches \(page 27\)](#)
  - Defining the paths
4. [Connect the disk array \(page 29\)](#)
  - Verifying disk array device recognition
5. [Configure disk array devices \(page 30\)](#)
  - Initializing and label the devices
  - Mounting the devices
  - Verifying file system operation

---

# Install and configure the disk array

The HP service representative performs these tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing the channel adapters (CHAs) and cabling
- Installing and formatting devices

After these tasks are finished, you will use Command View or LUN Configuration Manager to complete the remaining tasks listed below. If you do not have Command View or LUN Configuration Manager, your HP service representative can perform these tasks for you.

The following restrictions apply when configuring any XP disk array with an OVMS host:

- When an XP port is assigned to OpenVMS, that port may not be shared with any other operating system.
- Multiple OpenVMS hosts may share the same XP port.
- Sharing of CHA microprocessors is not recommended.

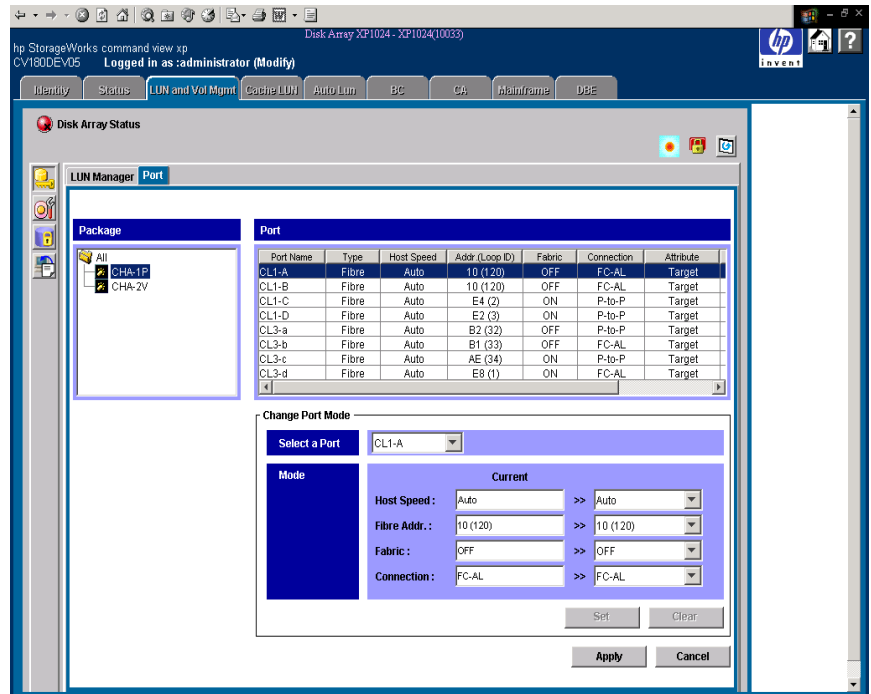
## Setting the System Option Modes

The HP service representative sets the System Option Mode(s) based on the operating system and software configuration of the host.

Mode	Level	Description and Usage
161	Mandatory	Allows high-speed microprocessor FW update.
228	Mandatory	Provides unique UUIDs to the boot device, which allows the SRM console WWIDMGRquickset to discover multiple boot paths.
278	Mandatory	RCSN notification that allows new XP128 ports to be used/identified when adding to an existing configuration.

## Configuring the Fibre Channel ports

Configure the Fibre Channel ports on the disk array using Command View (shown) or the Fibre Parameter window in LUN Configuration Manager. Select the settings for each port based on your storage area network topology. Use switch zoning if you connect different types of hosts to the array through the same switch.

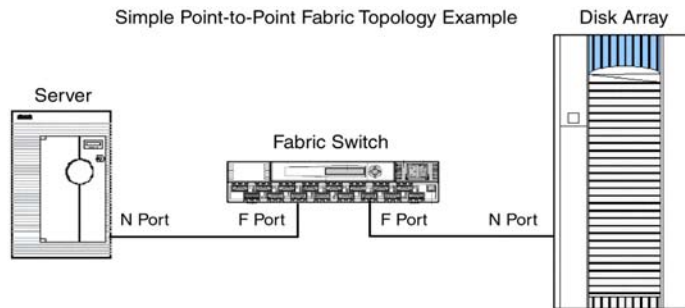


### Fibre address

In fabric environments, the port addresses are assigned automatically.

## Fabric and connection parameter settings

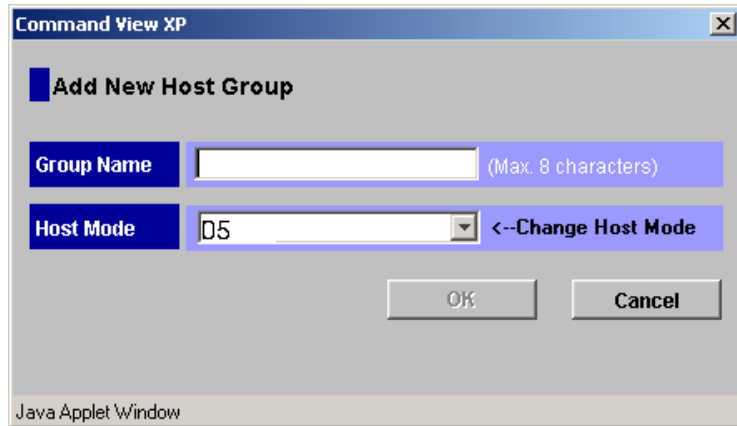
Set each array port to FABRIC ON or OFF with connections of POINT-TO-POINT or FC-AL as shown in the following table and figures. For detailed topology information, refer to the *HP StorageWorks SAN Design Reference Guide* on the [hp.com](http://hp.com) website. .



Fabric Parameter	Connection Parameter	Provides
ON	FC-AL	Not supported by Open VMS
ON	Point-to-Point	N-port (fabric port, direct connect)
OFF	FC-AL	Not supported by Open VMS
OFF	Point-to-Point	Not supported

## Setting the Host Mode for the disk array ports

The disk array ports have Host Modes that you must set depending on the host you use. After the disk array is installed, use Command View (shown) or LUN Configuration Manager to set the Host Mode for each port.



Command View XP

**Add New Host Group**

Group Name  (Max. 8 characters)

Host Mode  <--Change Host Mode

OK Cancel

Java Applet Window

The required Host Mode setting for Open VMS is **05**.

---

# Install and configure the host

This section explains how to install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

## Loading the OS and software

Follow the manufacturer's instructions to load the operating system and software onto the host. Load all OS patches and configuration utilities supported by HP and the HBA manufacturer.

## Installing and configuring the HBAs

Install and configure the host bus adapters using the HBA manufacturer's instructions.

### Verify FC HBA installation and set fabric mode by using `wwidmgr`:

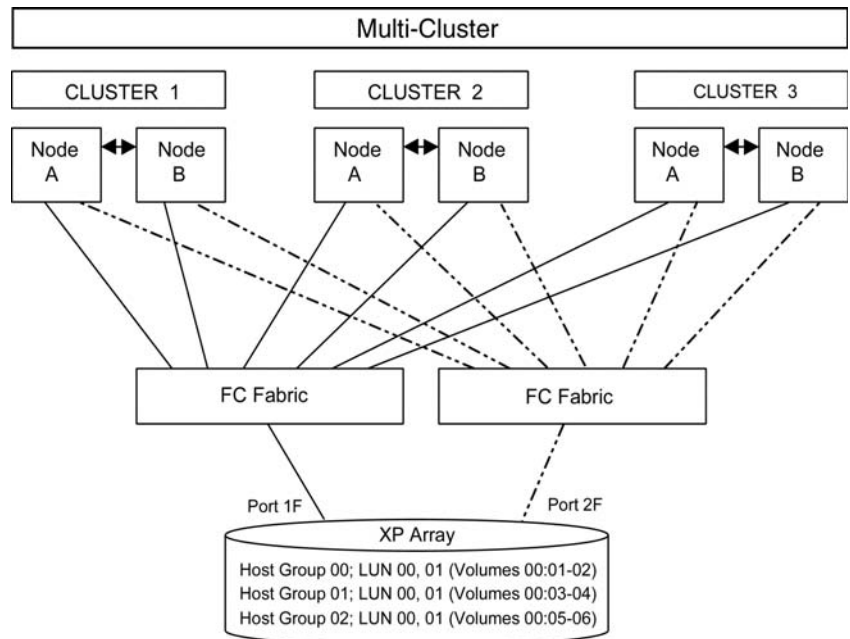
1. P00 >>> **set mode diagnostic**
2. P00 >>> **wwidmgr -show adapter**  
The list of adapters is displayed.
3. P00 >>> **wwidmgr -set adapter -item xxxx -topology fabric**  
This sets the HBA for the required fabric mode.
4. P00 >>> **wwidmgr -show adapter**  
The list of adapters is displayed, showing fabric topology.
5. P00 >>> **initialize**



## Clustering and fabric zoning

Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.

Clustering software is an integral part of OpenVMS, however, it requires a license. Refer to the HP manual “Guidelines for OpenVMS Cluster Configurations” for complete instructions.



Within the Storage Area Network (SAN), the clusters may be homogeneous (all the same operating system) or they may be heterogeneous (mixed operating systems). How you configure LUN Security and fabric zoning depends on the operating system mix and the SAN configuration.

## Fabric zoning and LUN security for multiple operating systems

You can connect multiple clusters of various operating systems to the same switch and fabric using appropriate zoning and LUN security as follows:

- Host zones must contain only homogeneous operating systems.
- Storage port zones may overlap if more than one operating system needs to share an array port.
- Heterogeneous operating systems may share an XP array port if you use Secure Manager and set the appropriate host group and mode. All others must connect to a dedicated XP array port.
- Use Secure Manager for LUN isolation when multiple hosts connect through a shared array port. Secure Manager provides LUN security by allowing you to restrict which LUNs each host can access.

Environment	OS Mix	Fabric Zoning	LUN Security
Standalone SAN (non-clustered)	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple hosts connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Clustered SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	
Multi-Cluster SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	

---

## Configure FC switches

Open VMS supports Fibre Channel only in a switch topology. Refer to the switch documentation to set up the switch. The disk array may support a large number of LUs. Open VMS supports 32,768 LUs per port.

### Defining the paths

Use Command View (shown) or LUN Configuration Manager to create paths (LUNs) between hosts and volumes in the disk array. This process is also called “LUN mapping.” LUN mapping includes:

- Configuring ports
- Setting LUN security
- Creating host groups
- Assigning host bus adapter WWNs to host groups.
- Mapping volumes to host groups (by assigning LUNs).

See the Command View or LUN Configuration Manager guide for more information. Note the LUNS and their ports, WWNs, nicknames, and LDEVs for later use in verifying host and device configuration.

Path configuration for Open VMS requires the following steps:

1. If you will be using RAID Manager, define a single “command device” LUN per XP array and present it to the Open VMS hosts across all connected paths.



---

## Connect the disk array

Connect the disk array to the host as follows:

1. The HP service representative verifies operational status of the disk array channel adapters, LDEVs, and paths.
2. The HP representative connects the Fibre Channel cables between the host and Fibre Channel switches.
3. Create Fibre Channel zones connecting the host systems to the XP ports.
4. Use the SYSMAN program to configure each Open VMS system on the SAN.

For a single system:

```
$run sys$system:sysman  
sysman> io autoconfigure
```

For all the systems in an Open VMS cluster:

```
$run sys$system:sysman  
sysman>set environment/cluster  
sysman> io autoconfigure
```

5. Verify the ready status of the XP LUNs.

## Verifying disk array device recognition

Verify that the host recognizes the disk array devices:

1. Log into the SYSTEM account, and enter the **show device dg** command:  
**\$ show device dg**
2. Check the list of peripherals on the host to verify the host recognizes all disk array devices. If any devices are missing, check disk array path configuration, check host HBA configuration, and check cables.
3. Record the disk numbers and other device information. You will need the disk numbers when you format, partition, and mount the disks.

---

## Configure disk array devices

Configure the disk array devices in the same way you would configure any new disk on the host server. Creating scripts to configure all devices at once may save you considerable time.

### Initializing and label the devices

Use the **initialize** command to format each disk array volume and write an identifying label on it:

*Example*            **\$ init \$1\$dga100 testscsi**

### Mounting the devices

Use the **mount** command to mount and identify each disk array volume:

*Example*            **\$ mount \$1\$dga100 testscsi**

### Verifying file system operation

1. Use the show device d command to list the devices:

*Example*            **\$ show device dg**

2. Create a test user directory:

*Example*            **\$ create/directory \$1\$dga100:[user]**

This command creates a user directory name USER at the top level of the newly added volume \$1\$DGA100.

3. Verify that this directory exists:

*Example*            **\$ set default \$1\$dga100:[user]**

**\$ show default**  
\$1\$dga100:[user]

If the user directory does not exist, Open VMS returns an error.

4. Create a test user file:

*Example*

```
$ create test.txt  
this is a line of text for the test file test.txt  
[Control-Z]
```

The **create** command creates a file with data entered from the terminal. **Control-Z** terminates the data input.

5. Verify whether the file is created:

*Example*

```
$ directory  
Directory $1$DGA100:[USER]  
TEST.TXT;1  
Total of 1 file.
```

6. Verify the content of the data file:

*Example*

```
$ type test.txt  
this is a line of text for the test file test.txt
```

7. Delete the data file:

*Example*

```
$ delete test.txt;  
$ directory  
%DIRECT-W-NOFILES, no files found  
$ type test.txt  
%TYPE-W-SEARCHFAIL,error searching for  
$1$DGA100:[USER]TEST.TXT;  
-RMS-E-FNF, file not found
```

The **delete** command removes the test.txt file. The **directory** command verifies that the test.txt file is removed, and the **type** command verifies that the test.txt file is no longer in the system.

8. Delete the test user directory by entering this command:

*Example*

**\$ delete \$1\$dga100:[000000]user.dir;**

**\$ show default**

\$1\$DGA100:[USER]

%DCL-I-INVDEF, \$1\$DGA100:[USER] does not exist

The **delete** command removes the USER directory from the disk volume. The **show default** command verifies that the user directory is removed.

9. Restore the default directory by entering this command:

**set default sys\$login:**



---

# Troubleshooting

This section includes resolutions for various error conditions you may encounter.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See ["Calling the HP support center"](#) (page 36).

---

## Error conditions

Depending on your system configuration, you may be able to view error messages as follows:

- View SIMs in Command View (Device Health tab).
- View R-SIMs in Remote Control XP, including reference codes and severity levels of recent R-SIMs.
- View SIMs that generate SNMP traps on the host.

Error Condition	Recommended Action
The logical devices are not recognized by the host.	<p>Verify that the host mode is set correctly for the XP array. See "Setting the Host Mode for the disk array ports" (<a href="#">page 23</a>).</p> <p>Verify that the CU is between 0&lt;&gt;31, AND LDEV is between 0&lt;&gt;255.</p> <p>Verify that the READY indicator lights on the disk array are ON.</p> <p>Verify that the topology is set correctly for the HBA and that the Fibre Channel cables are properly connected. Check the status information LEDs for the HBA, the status LEDs, and other information Fibre Channel switch and the XP array.</p> <p>Check zoning on the switch.</p>
Physical volumes cannot be created.	<p>Verify that the disk array logical devices are correctly formatted. See "Configure disk array devices" (<a href="#">page 30</a>).</p>
Logical volumes cannot be created.	<p>Verify that the volume capacity for OPEN-x volumes is not greater than the maximum capacity allowed. See the Device Emulations Appendix.</p> <p>Verify that the capacity of the volume group is not less than the total capacity of the partitioned logical volume.</p>

Error Condition	Recommended Action
The disk array responds “Not Ready” or the disk array has displayed “Not Ready” and timed out.	Contact HP.
The host does not boot up.	<p>Check the HBA and make sure it was installed properly according to the HBA manufacturer’s instructions.</p> <p>Check the HBA topology. It should be set to <b>fabric</b>.</p>
The HBA is not configured by the host on bootup.	Verify that the HBA is supported by the version of the host operating system and the required minimum ECO kits are installed. ECO kits for HP products are available online from <a href="http://www.itrc.hp.com">http://www.itrc.hp.com</a> .
Storage is not seen on the adapter by the console program before boot, or on the host after boot.	<p>Check the HBA and make sure it was installed properly.</p> <p>Verify that the topology is set correctly for the HBA and that the Fibre Channel cables are properly connected. Check the status information LEDs for the HBA, the status LEDs, and other information Fibre Channel switch and the XP array.</p> <p>Check the zoning on the switch.</p> <p>Verify that the disk array Host Mode is set correctly. The Host Mode setting for Open VMS is <b>05</b>.</p>

---

## Calling the HP support center

If you are unable to resolve an error condition, contact the HP support center for assistance.

### Contact Information

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arraysystems.html>

### Before you call

Be sure to have the following information available:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

---

## Disk array device emulations

This appendix provides information about supported emulations and device type specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

## Supported emulations

XP Model	OPEN Emulation Type	OPEN Emulation Supported	LUSE	CVS	LUSE & CVS
XP48 XP512	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K	Yes	Yes	Yes	Yes
	OPEN-L	Yes	Yes		
	OPEN-M	Yes	Yes		
	OPEN-V				
XP128 XP1024 XP12000	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K				
	OPEN-L	Yes	Yes		
	OPEN-M				
	OPEN-V	Yes	Yes		

## Device type specifications

Device Type (Note 1)	Category (Note 2)	Blocks (512 bytes )	Sector Size (bytes)	# of Cylinders	Heads	Sectors per Track	Capacity MB* (Note 3)
OPEN-3	SCSI disk	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	71192160	512	49439	15	96	34761
OPEN-V	SCSI disk	max=125827200	512	Note 5	15	128	Note 6
<b>LUSE</b>							
OPEN-3*n	SCSI disk	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	71192160*n	512	49439*n	15	96	34761*n
OPEN-V*n	SCSI disk	max=125827200 Note 4	512	Note 5	15	128	Note 6
<b>CVS</b>							
OPEN-3 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
<b>CVS LUSE</b>							
OPEN-3*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-V*n	SCSI disk	Note 4	512	Note 5	15	128	Note 6

\*Capacity = (512 x number of blocks) ÷ 1024<sup>2</sup>

**Note 1:** The availability of a disk type depends on the disk array.

**Note 2:** The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

**Note 3:** The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

**Note 4:** The number of blocks for a CVS volume is calculated as follows:  
# of blocks = (# of cylinders) × (# of heads) × (# of sectors per track)

**Example 1:** For an OPEN-3 CVS volume with capacity = 37 MB:  
# of blocks = (53 cylinders—see Note 5) × (15 heads) × (96 sectors per track) = 76320

**Example 2:** For an OPEN-V CVS volume with capacity = 49 MB:  
# of blocks = (53 cylinders—see Note 5) × (15 heads) × (128 sectors per track) = 101760

**Note 5:** The number of cylinders for a CVS volume is calculated as follows (↑ ...↑ means that the value should be rounded up to the next integer):

**OPEN-3/8/9/E:** The number of cylinders for a CVS volume =  
# of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑

**Example:** For an OPEN-3 CVS volume with capacity = 37 MB:  
# of cylinders = ↑ 37 × 1024/720 ↑ = ↑ 52.62 ↑ (rounded up to next integer) = 53 cylinders

**OPEN-V:** The number of cylinders for a CVS volume =  
# of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑

**Example:** For an OPEN-V CVS volume with capacity = 49 MB:  
# of cylinders = ↑ 49 × 16/15 ↑ = ↑ 52.26 ↑ (rounded up to next integer) = 53 cylinders

**OPEN-3/8/9/E:** The number of cylinders for a CVS LUSE volume =  
# of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑ × n



**Example:** For a CVS LUSE volume with capacity = 37 MB and  $n = 4$   
# of cylinders =  $\lceil 37 \times 1024 / 720 \rceil \times 4 = \lceil 52.62 \rceil \times 4 = 53 \times 4 = 212$

**OPEN-V:** The number of cylinders for a CVS LUSE volume =  
# of cylinders =  $\lceil (\text{capacity (MB) specified by user}) \times 16 / 15 \rceil \times n$

**Example:** For an OPEN-V CVS LUSE volume with capacity = 49 MB and  $n = 4$   
# of cylinders =  $\lceil 49 \times 16 / 15 \rceil \times 4 = \lceil 52.26 \rceil \times 4 = 53 \times 4 = 212$

**Note 6:** The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using the LUN Configuration Manager or Command View software.



---

## Glossary

<b>AL</b>	Arbitrated loop.
<b>AL-PA</b>	Arbitrated loop physical address.
<b>BC</b>	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
<b>CA</b>	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
<b>Command View</b>	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation.
<b>command device</b>	An LDEV that transfers RAID Manager commands to BC or CA logical volumes.
<b>CVS</b>	CVS devices (OPEN-x CVS) are custom volumes that are smaller than normal fixed-sized logical disk devices (volumes).
<b>DKC (disk controller unit)</b>	The array cabinet that houses the channel adapters and service processor (SVP).
<b>DKU (disk cabinet unit)</b>	The array cabinets that house the disk array physical disks.
<b>emulation modes</b>	Emulation modes can be assigned to LDEVs to make them operate like standard OPEN system disk drives. The emulation mode of an LDEV determines its capacity. Refer to the appendices for device capacities.
<b>FC</b>	Fibre Channel.

<b>FC-AL</b>	Fibre Channel arbitrated loop.
<b>FCP</b>	Fibre Channel Protocol.
<b>HBA</b>	Host bus adapter.
<b>HP</b>	Hewlett-Packard Company.
<b>LDEV</b>	Logical device. An LDEV is created when a RAID group is divided into sections using a selected host emulation mode (for example, OPEN-9 or OPEN-M). The number of resulting LDEVs depends on the emulation mode. “LDEV” and “volume” are synonyms.
<b>LUN</b>	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
<b>LUSE</b>	Logical Unit Size Expansion, a feature which logically combines LDEVs so they appear as a larger LDEV. This allows a LUN to be associated with 2 to 36 LDEVs. LUSE allows applications to access data requiring large amounts of disk space.
<b>OFC</b>	Open Fibre Control.
<b>OPEN-x</b>	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
<b>OS</b>	Operating system.
<b>path</b>	“Path” and “LUN” are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.
<b>port</b>	A connector on a channel adapter card in the disk array. A port passes data between the disk array and external devices, such as a host server. Ports are named using a port group and port letter, for example, CL1-A.
<b>RAID</b>	Redundant array of independent disks.

<b>remote console PC</b>	The PC running HP StorageWorks Remote Control XP.
<b>Remote Control (RC)</b>	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
<b>R-SIM</b>	Remote service information message.
<b>SCSI</b>	Small computer system interface.
<b>SIM</b>	Service information message.
<b>SNMP</b>	Simple Network Management Protocol.
<b>SVP</b>	Service processor. A notebook computer built into the disk array. The SVP provides a direct interface to the disk array and is used only by the HP service representative.
<b>TID</b>	Target ID.
<b>VSC</b>	Volume Size Configuration is a feature that defines custom volumes (CVS volumes) that are smaller than normal fixed-sized logical disk devices (volumes).
<b>WWN</b>	World Wide Name. A unique identifier assigned to a Fibre Channel device.



## A

adapters

host bus 24

host bus,configuration

HBA 24

audience

intended 5

authorized reseller, HP 8

## B

Business Copy XP 16

## C

clustering 25, 26

command devices, RAID Manager 16

Command View XP 14, 16, 19

configuration

device 30

disk array 19

host 24

ports 21

System Option Modes 20

configure devices 30

configuring ports 21

connecting

disk array 29

connection problems

troubleshooting 36

console commands

mount 30

set def 30

show default 30

show device d 29

Continuous Access XP 16

conventions

documentation 6

## D

device emulation types

supported 15

device recognition

verifying 29

device specifications 39

device types

supported 15

devices

configuring 30

verification 29

disk array

connecting 29

installation 19

- disk arrays
  - storage capacity 14
  - supported 5
- documentation
  - conventions 6
  - related 5

**E**

- emulation, supported devices 15
- emulations 38

**F**

- fabric zoning 25, 26
- failover 16
- features and requirements 14
- fiber parameter settings 22
- Fibre Channel
  - adapters, configuring 24
  - interfaces, supported 15
  - parameter settings 22
  - topology example 22
- Fibre Channel adapters
  - configuring 24
- Fibre Channel interface 15
- Fibre Channel ports 21
- Fibre Chennel
  - port addresses 21
  - ports, configuring 21

**G**

- Glossary 43

**H**

- HBA card
  - verify installation 24
- HBAs
  - configuring 24

- help
  - obtaining 7
- host mode 23
- host, installing and configuring 24
- HP
  - authorized reseller 8
  - technical support 7
- HP-UX
  - supported versions
    - Unix
      - supported versions of HP-UX 14

**I**

- installation 18--??
  - disk array 19
  - overview 18
  - procedures 18
  - verify HBA card 24
- interface
  - Fibre Channel 15
- interface(s)
  - Fibre Channel 15

**L**

- LUN Configuration Manager 27
  - define LUN mapping 27
- LUN Configuration Manager XP 14, 16, 19
- LUN management 14
- LUN security 25, 26
- LUNs
  - mapping 27

**M**

- multi-cluster environment 25

**O**

- operating systems, multiple 26
- optional software 14



## **P**

- paths
  - defining 27
- paths, defining
  - LUNs
    - creating 27
- port
  - addresses 21
- ports
  - configuring 21
  - Fibre Channel 21
- ports, configuring 21

## **R**

- RAID Manager
  - command devices 16
- RAID Manager command devices 16
- related documentation
  - list of 5
- Remote Control 14
- requirements and features 14

## **S**

- Secure Manager XP 14, 26
- security, LUN 25, 26
- SNMP configuration 17
- software options 14
- software, optional 14
- storage capacity 14
- StorageWorks, optional software 14
- system administrator
  - required knowledge 5
- system diagnostics
  - verify 30
- system option mode 20
- System Option Modes 20

## **T**

- technical support
  - HP 7
- troubleshooting 33
  - error conditions 34
  - HP Support Center 36

## **W**

- warranty 10

## **X**

- XP family
  - optional software 14
- XP1024
  - support for 5
- XP128
  - support for 5

## **Z**

- zoning, fabric 25, 26

